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Management of Production Risk for Hawai'i Ranchers

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Risk, the probability that an adverse event will occur, has always been a significant challenge in agriculture (Tranel et al. 2004). Producers understand the potential for certain risk factors (bad weather, low prices, increasing costs) and may feel that the impact of these factors cannot be avoided. For example, the risk of drought severely impacting agricultural production is a very real and common event. Drought is impacting agricultural production somewhere in the world at any point in time. While little can be done to prevent drought, producers can take action to minimize the impact of drought on their operations.

Sources of agricultural risk fall into five broad categories: production, marketing, finance, legal, and human resources (USDA Risk Management Agency). Each contains several factors that could adversely impact ranch operations. While producers cannot always predict or prevent adversity, they can plan and prepare for the possibility. Indeed, the development of appropriate risk management plans can often mean the difference between failure and survival of the operation when an adverse event occurs.

Several sources of production risk pose a threat to ranch operations. Producers need to be able to identify the sources of production risk that threaten their operations in order to develop suitable management plans. This publication provides an overview of various sources of production risk and outlines management plans to mitigate and minimize the impacts of pests, disease, and drought on ranching operations.

Sources of production risk

Production risk factors generally arise from weather events, diseases, pests, and management decisions. The chance that these events will occur varies widely across Hawai'i, and some are more prevalent in some areas of the state than in others. Likewise, different operations are more susceptible to risk than others. Consequently, each ranch operation should evaluate its exposure to the various possible events in order to develop an appropriate management plan that will ensure survivability.

Weather events

Ranch operations are at risk from extreme weather. The impact of adverse weather conditions on ranch operations affects both forage production and animal performance. For example, without adequate precipitation, forage production is diminished, and drought conditions that persist will eventually affect animal production.

Pests

Pests affect both livestock production and forage resources. Livestock pests include flies, worms, ticks, grubs, and others. Without appropriate mitigation measures, these pests can greatly impact livestock performance and result in a loss in ranch revenue.

Pests affecting forages include insects (army worm, scale, aphids), fungi (root rot), plant diseases, and weeds. All of these result in reduced forage quantity and quality. The loss of forage quantity and quality results in reduced carrying capacity and animal condition.

Disease

Livestock diseases (such as johnes, brucellosis, foot and mouth, tuberculosis, anaplasmosis, and scrapie) are numerous, and many, if contracted, can decimate a ranch operation. Fortunately, there are well established procedures that, if employed, can help prevent the contraction of many diseases. Hawai'i is considered "disease free" for brucellosis, anaplasmosis, and blue tongue. Continued monitoring and diligence in preventive measures will ensure that this status is maintained and new disease threats are minimized.

Management decisions

So far, this discussion has focused on factors that are beyond the ability of the producer to prevent. However, the production risk factors that result from management decisions can be prevented through training and better planning. Poor management decisions can result in loss of soil fertility, soil erosion, loss of pasture productivity, increase in invasive weeds, poor animal performance (including low conception and calving rates, low daily rates of gain, and chronic health problems). In contrast, good management decisions lead to improved pasture condition, good herd health, and better animal performance.

Management of production risk

Many of the production risk factors that ranchers in Hawai'i face are beyond their ability to control, stop, or eliminate. What cannot be controlled, stopped, or eliminated must be lived with. It is a reality that drought happens and that pest and diseases exist, and these factors will always be a threat to ranch operations.

When a given risk factor becomes a reality, the difference between the ranches that survive and those that do not is often the result of having a management plan in place before the event occurs. Ranch operations that face drought without a management plan are forced to react to a rapidly changing and deteriorating management environment. Desperation and despair often drive decisions, and this scenario may result in the failure of the operation.

By contrast, ranch operations with management plans in place are guided by decisions that were developed when stress was not a significant factor. This eliminates irrational and emotional decisions, which can compound the effects of the adversity. More often than not, this scenario results in the survival of the ranch operation even under the most difficult adversities.

Every ranch operation should evaluate exposure to certain production risk factors and develop appropriate risk management plans. When done correctly, these plans will help the ranch operation mitigate and minimize the effects of adverse events. The following discussion outlines important considerations for the development a pest management plan, a biosecurity plan, and a drought management plan.

Pest management program

A complete pest management program will include measures to control pests that affect your livestock and pasture resources. Specifically, your pest management program should comprise three components:

- a livestock pest management plan that addresses animal parasites and insects
- a pasture pest management plan that focuses on diseases and insects that affect your pastures
- an integrated weed management plan.

Livestock pest management plan

The objectives of a livestock pest management plan should be developed in coordination with a veterinarian. CTAHR Cooperative Extension agents and specialists can assist in developing objectives and measures for the control of pests for your range and pasture lands.

The focus of pest management activities for livestock should be on *regular* treatment for internal and external parasites, flies, and other insect pests. Regular treatments help maintain herd health by keeping parasite loads at a minimum and preventing parasites from building immunities or tolerances to treatments.

A wide array of pesticides is available to successfully control animal pests. These include avermectins, pyrethroids, and organophosphates. Often, alternating between these different types of pesticides produces the best long-term control of pests. Alternating formulations prevents the pest population from building resistance to the pesticides.

A variety of application methods is also available. These include pour-on, injection, spray, bolus, ear-tag, and feed additive. The method used depends on the preferences of the rancher, as each method has its positive and negative points.

The pest management plan should provide for regular treatments of all animal-handling facilities. Because these facilities are areas where livestock are concentrated, they can be major source areas for pest outbreaks.



Livestock pests such as flies (left) and forage pests such as scale (above), pose significant risks to ranch production.

These areas should be treated with pesticides through surface sprays, manure sprays, and traps, which will help reduce pest populations.

Pasture pest management plan

A complete pest management program will also include a pasture pest management plan focused on reducing the effects of plant diseases and insect pests on your forage resources. Pests that can affect forages include insects and fungal diseases. One method to protect the ranch's forage resources is to increase the diversity of forage species in the pasture. This works because some pests are host-specific. With increased forage diversity, there is a decreased risk of losing the whole pasture.

Another technique is to inter-seed pastures with pest-resistant forage varieties. The variety of forage inter-seeded will depend on the particular pest risk. The yellow sugarcane aphid-resistant cultivar of kikuyugrass developed by CTAHR is an example of a forage cultivar developed to be resistant to a specific pest. Other cultivars of grasses may be resistant to a variety of pests, and each should be evaluated based on the particular risk factors.

When a heavy pest outbreak occurs, selective use of pesticides to control the outbreak often can be effective. However, this practice can be very expensive. Consequently, it should be used sparingly and only on high-priority areas. A less expensive and more extensively applicable technique is to temporarily increase the grazing pressure during the outbreak. This effectively removes habitat necessary for the pests to complete their

life cycles. In addition, the new forage growth is more vigorous and better able to resist pest damage.

For more information on livestock pests, go to www.ctahr.hawaii.edu/freepubs and look under Livestock Management.

Integrated weed management plan

When developing an integrated weed management plan (IWMP), you should include three measures or levels of activity: prevention, control, and immediate response.

- Implement preventive measures to keep land free of weeds where they have not become established. This will greatly reduce weed control costs later (prevention).
- Set priorities for control and/or elimination of weeds where they have become established (control).
- Take prompt action when weeds first appear (immediate response).

Successful control of weeds will depend on the degree of planning and management actions implemented. Ranchers need to be able to adapt to the changing characteristics of weed infestations as the weed progresses through its life cycle. For this reason, an *adaptive management strategy* works best in controlling weeds in your range and pasture lands.

The adaptive management process describes a cycle of management steps or events that facilitate planning, implementation of actions, monitoring of outcomes, and making adjustments to changing situations (see diagram, p. 4). The adaptive management process involves six steps

or events:

- establishing goals
- setting management priorities
- identifying appropriate methods
- developing and implementing an integrated weed management plan
- monitoring results
- modifying priorities and improving the management plan.

A successfully integrated weed management program will include a combination of weed control measures. Weed control measures are broadly categorized into preventive, physical, cultural, biological, and chemical control strategies.

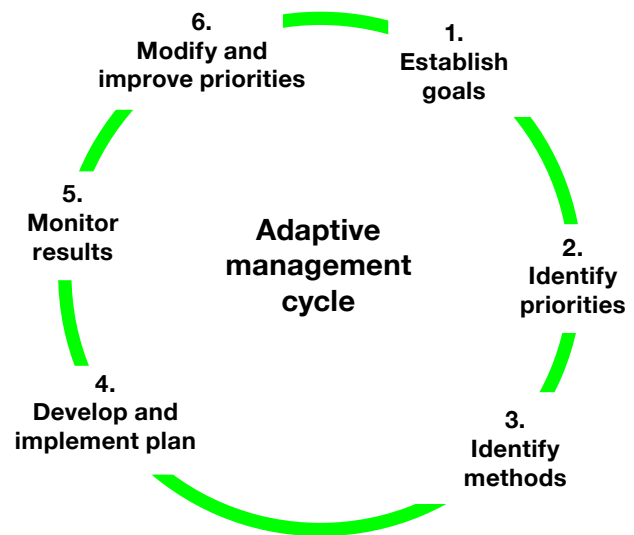
- Preventive weed control strategies keep weeds from invading and becoming established.
- Physical strategies can include control measures like pulling, mowing, grazing management, and multi-species grazing.
- Cultural strategies include certain cultivation practices, re-seeding, fertilization, and irrigation.
- Biological strategies are typically developed by federal and state governments and include plant pathogens, such as insects, that target a weed of interest. This strategy is not one that producers will use independently.
- Chemical herbicides can be effective but are costly when used on an extensive scale. Thus their use should be restricted to small areas, such as along roads and around corrals and buildings, and it should be integrated with a more extensive control measure in your pastures, multi-species grazing for example.

A full discussion of the adaptive management process and integrated weed management practices can be found in the CTAHR publication *Fireweed Control: An Adaptive Management Approach* (Thorne et al. 2005).

Biosecurity plan

The goal of a biosecurity plan is to reduce the risk of disease transmission between animals within a herd and among herds. Three principles are addressed in an effective biosecurity plan:

- Increase the animal's ability to resist disease.
- Minimize the number of contacts that might result in disease transmission.
- Eliminate sources of infectious agents.



Addressing each of these will greatly reduce the chance that disease will affect ranch operations.

The principal approach to effectively increase the animal's ability to resist disease is a vaccination program. However, vaccinations do not manage all important disease risk factors. It is best to view vaccinations as part of a strategic herd health plan and a supplement to other disease control measures.

Several factors influence efforts to minimize the number of contacts that result in disease transmission. The length of contact time and number of disease agents transferred governs contact disease transmission. The longer diseased animals are in contact with other animals, the more disease agents can be transferred. Likewise, if the diseased animal is highly contagious, with a high number of disease agents available for transfer, the more likely it is that other animals will contract the disease.

Ranchers can reduce the number of effective contacts by physically separating sick animals from the herd (quarantine). In some instances, segregating herds by age or class of animal will be sufficient to limit effective contacts. In other cases, placing herds in large pastures will effectively reduce disease transmission. Reducing the number of disease agents transmitted (dose load) requires the use of preventive medications. Keeping animal working facilities clean will also help reduce the number of disease agents that can be transmitted.



The impact of drought on ranch resources is broad in scope, affecting the ecological, economic, and social sustainability of the operation.

Eliminating the sources of infectious agents requires an understanding of the life cycle of the various diseases that threaten ranch operations. Identifying animals or objects that the disease agent depends on for survival is necessary. Specialized training may be needed to develop a full understanding of the life cycle of diseases. Consequently, producers need to work closely with a veterinarian to identify reservoirs of infection and determine the best methods to reduce or eliminate these reservoirs. Potential reservoirs of infection on ranches include livestock, birds, insects, rodents, people, manure, soil, surface water, water tanks, and feed. Treatments depend on the location of these reservoirs and the agent involved.

Drought management plan

All droughts interfere with normal ranch operations. The impact of drought is broad in scope, as it threatens the economic, social, and ecological sustainability of the ranch operation. The sustainability of the ranch operation will be determined by how ranch resources are managed before and during the drought, and as it dissipates.

The proper management of ranch resources before drought occurs ensures that resources will be available for at least the early stages of a drought. Properly managed ranch operations usually emerge from short-term drought with little financial and production loss. Moreover, these same operations are in the majority of those that survive long-term drought conditions.

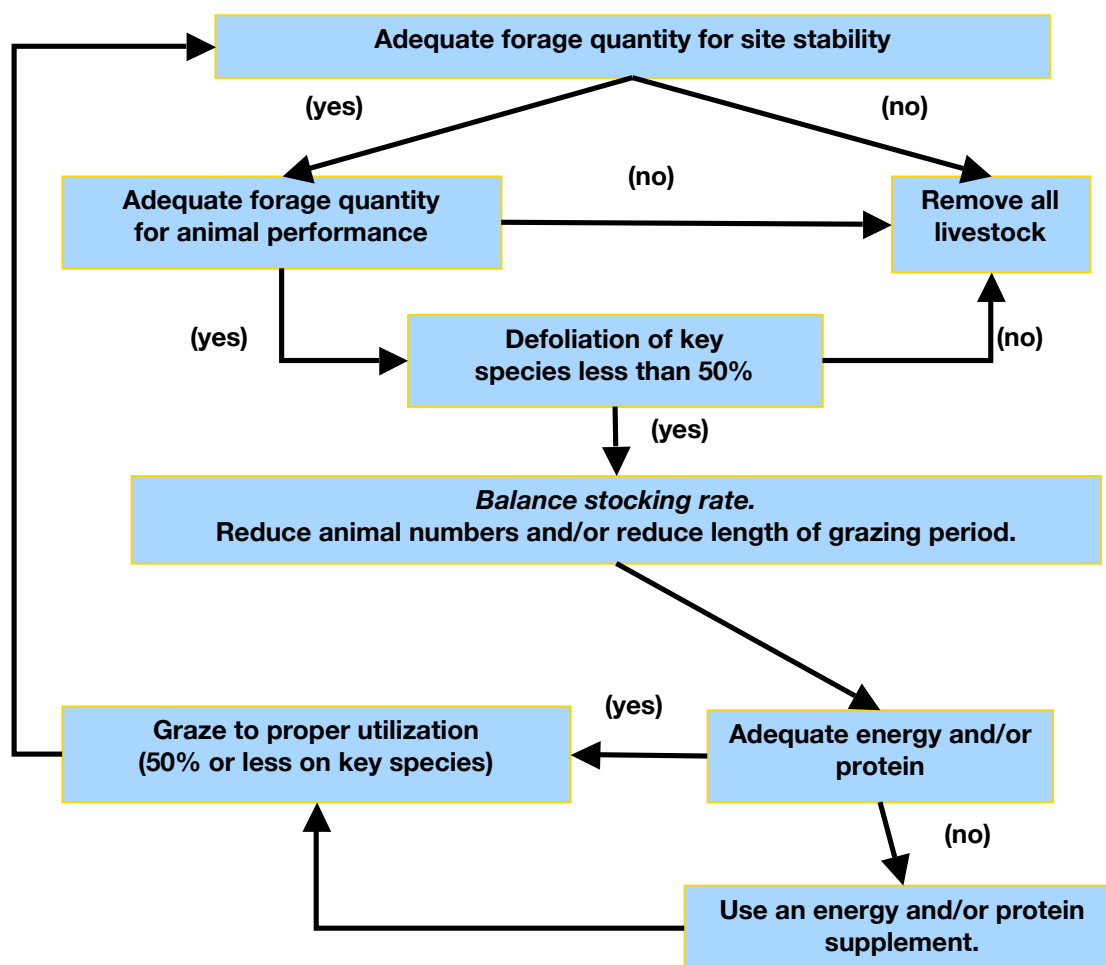
Important considerations for drought planning

- Determine the availability of alternative or reserve forages that could be used to reduce grazing pressure on pastures.
- Reserve 10–20% of forage resources in case vegetation recovery falls short of expectations.
- Calculate stocking rates for each pasture.
- Keep and use accurate grazing records for each pasture.
- Make and implement decisions early to avoid crises, as delays often lead to intensification of the problem, economic loss, and long-term damage to the forage resource.
- Resist the temptation to restock to former levels in the year following drought.
- Use next year's forage production for restoring protective plant litter and improving plant vigor.
- Plan to delay the initiation of grazing by 1–2 weeks to enhance plant recovery following a green-up resulting from a rain, as this delay may result in a 10–20% increase in forage production.
- Use rangeland resources efficiently. Evaluate distribution of livestock grazing in all pastures, increase use of lightly grazed areas and reduce use in over grazed areas, change the time or season of use, use strategic short-term placement of salt or minerals to attract animals to lightly used areas.

The decisions made as drought develops are crucial to the survivability of the ranch operation. If timely decisions are not made, herd performance will suffer from diminishing quantity and quality of forage resources during a drought. Animal deaths during drought usually occur when the right decisions are not made at critical times.

As drought dissipates, there is often a temptation to revert to pre-drought operation levels. This is almost always a mistake, especially if the drought has been particularly severe and long. Ranch resources, especially the land, forage, and water resources, need time to replenish

Decision rules for drought management of range and pasturelands in Hawai'i



or recover to pre-drought capacities. Thus, drought management should continue even as the drought conditions diminish.

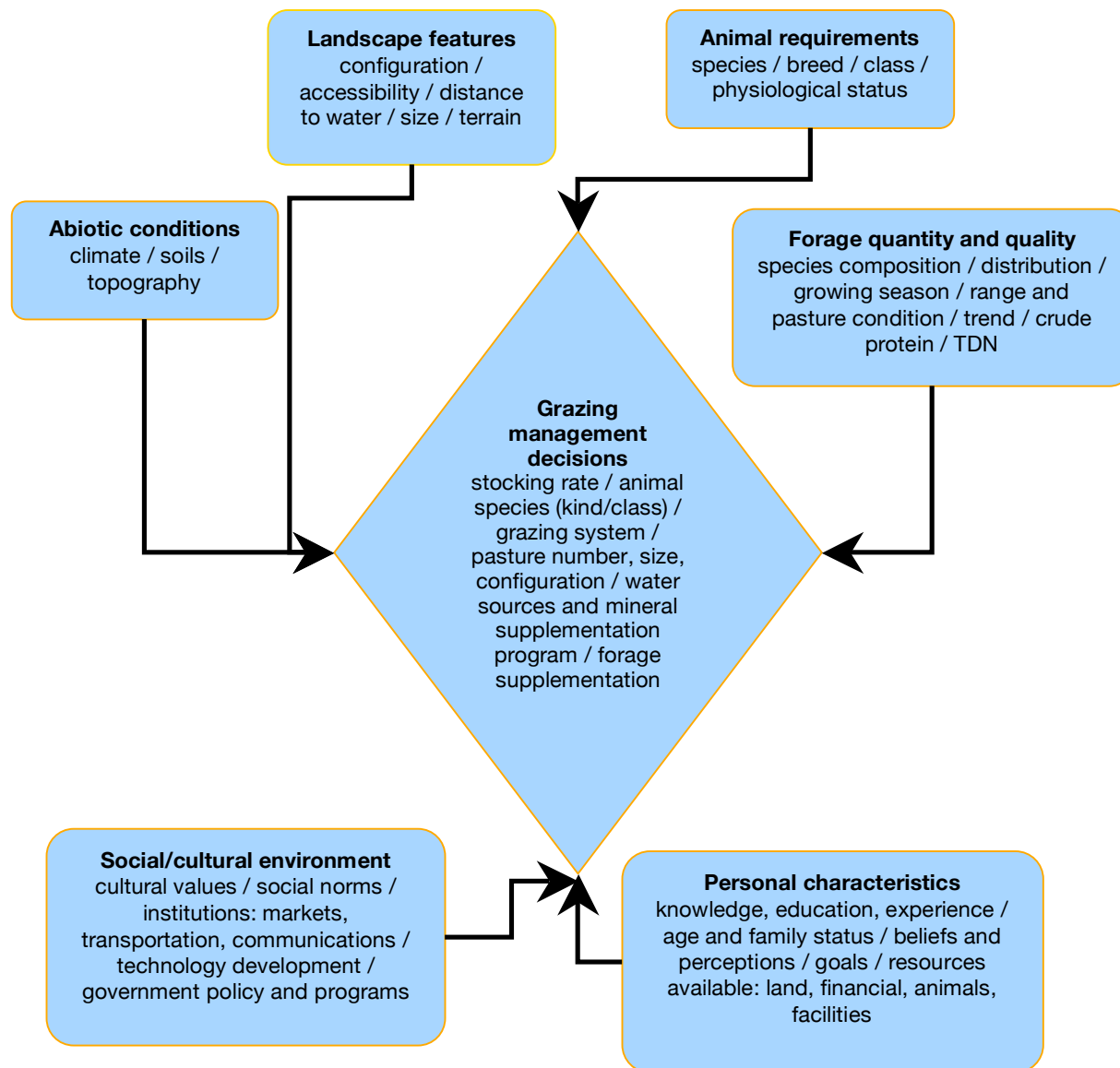
Writing a drought management plan is a valuable tool producers can use to help prepare for, manage, and recover from drought. The three broad goals of a drought management plan are

- Provide strategies to mitigate and manage the effects of drought on ranch resources.
- Provide a plan for recovery as the drought conditions diminish.
- Develop measures that prepare the ranch operation for the next drought.

Drought plans identify actions to be taken at the first sign of drought, as well as with continued indications of pending forage shortages. As drought conditions worsen, the critical nature of the decisions increases. Untimely, inappropriate decisions can lead to poor herd condition and severe damage to the land and forage resources, resulting in adverse consequences that continue to affect the ranch operation beyond the drought.

Effective drought management begins with appropriate and timely stocking rate adjustments. Plans for stocking rate adjustments need to be specific in terms of what and when certain adjustments will be made. Adjustments can include reductions in animal numbers,

The interrelationships among resources, activities, and external influences that make up the grazing management environment (adapted from Stuth et al. 1991).



reductions in the amount of time animals spend in each pasture, increases in leased acreage, or supplementation. The decision to make a specific adjustment should be driven by seasonal checkpoints or critical evaluation dates. Critical evaluation dates are those periods in the annual production cycle in which livestock requirements must be balanced with available forage. These critical

periods include breeding, calving, and the first three to four months after calving. A schematic diagram of critical decision rules for drought planning is provided in the diagram on p. 6.

Drought management plans should be evaluated and revised each time the operation completes a production year under short- or long-term drought. The objective is

to identify and address the weakest components of the management plan that have the greatest effect on production costs. Modifying plans to adjust livestock numbers to forage resources for the next year and for the next drought is also necessary.

Grazing management plan

The objective of a grazing management plan is to provide for the sustained ecological and economic productivity of the livestock operation. To achieve a balance between an ecologically and economically sustainable operation, the grazing animal must be viewed as both a tool and a product. Too much emphasis on the animal as a product results in the degradation of range and pasture resources. On the other hand, too much emphasis on land conservation practices results in economic loss. The principle is to optimize production within the constraints of what the land can support.

Grazing management decisions include determination of appropriate stocking rates for pastures; the kind and class of grazing animals used; the type of grazing system utilized (rotation, set-stock, high intensity—short duration, etc); pasture number, size, and configuration; the number, location, and type of water and mineral sources; and forage supplementation and substitution. These decisions are not made in isolation but are influenced by internal, personnel, and external factors (see diagram, p. 7). Thus, grazing management should be viewed as a system comprised of interacting components that can be manipulated for the greatest benefit of the operation (Stuth et al. 1991).

Summary

Risk in agricultural production is a constant condition that producers must deal with. How ranchers deal with the various risk factors that can reduce their production levels is largely dependent on their level of preparedness. The development of specific management plans helps producers prepare for events before they occur. Those who develop management plans for specific risk factors are more likely to survive than those who do not.

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